

PATENT COOPERATION TREATY

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INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

(Chapter II of the Patent Cooperation Treaty)

(PCT Article 36 and Rule 70)

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Applicant's or agent's file reference 117924	FOR FURTHER ACTION		See Form PCT/IPEA/416
International application No. PCT/AU2004/000393	International filing date (<i>day/month/year</i>) 29 March 2004	Priority date (<i>day/month/year</i>) 28 March 2003	
International Patent Classification (IPC) or national classification and IPC Int. Cl. 7 G01N 35/10, B41J 2/175			
Applicant PROTEOME SYSTEMS INTELLECTUAL PROPERTY PTY LTD et al			

1. This report is the international preliminary examination report, established by this International Preliminary Examining Authority under Article 35 and transmitted to the applicant according to Article 36.

2. This REPORT consists of a total of 3 sheets, including this cover sheet.

3. This report is also accompanied by ANNEXES, comprising:

a. (*sent to the applicant and to the International Bureau*) a total of 7 sheets, as follows:

sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications authorized by this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions).

sheets which supersede earlier sheets, but which this Authority considers contain an amendment that goes beyond the disclosure in the international application as filed, as indicated in item 4 of Box No. I and the Supplemental Box.

b. (*sent to the International Bureau only*) a total of (indicate type and number of electronic carrier(s)) , containing a sequence listing and/or table related thereto, in computer readable form only, as indicated in the Supplemental Box Relating to Sequence Listing (see Section 802 of the Administrative Instructions).

4. This report contains indications relating to the following items:

<input checked="" type="checkbox"/>	Box No. I	Basis of the report
<input type="checkbox"/>	Box No. II	Priority
<input type="checkbox"/>	Box No. III	Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
<input type="checkbox"/>	Box No. IV	Lack of unity of invention
<input checked="" type="checkbox"/>	Box No. V	Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
<input type="checkbox"/>	Box No. VI	Certain documents cited
<input type="checkbox"/>	Box No. VII	Certain defects in the international application
<input type="checkbox"/>	Box No. VIII	Certain observations on the international application

Date of submission of the demand 29 October 2004	Date of completion of the report 1 March 2005
Name and mailing address of the IPEA/AU AUSTRALIAN PATENT OFFICE PO BOX 200, WODEN ACT 2606, AUSTRALIA E-mail address: pct@ipaaustralia.gov.au Facsimile No. (02) 6285 3929	Authorized Officer GREG POWELL Telephone No. (02) 6283 2308

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

International application No.

PCT/AU2004/000393

Box No. I Basis of the report

1. With regard to the language, this report is based on the international application in the language in which it was filed, unless otherwise indicated under this item.

- This report is based on translations from the original language into the following language, which is the language of a translation furnished for the purposes of:
- international search (under Rules 12.3 and 23.1 (b))
 - publication of the international application (under Rule 12.4)
 - international preliminary examination (under Rules 55.2 and/or 55.3)

2. With regard to the elements of the international application, this report is based on (*replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report*):

- the international application as originally filed/furnished

the description:

pages 1, 4-8 as originally filed/furnished

pages* 2, 3, 3a received by this Authority on 27 January 2005 with the letter of 27 January 2005

pages* received by this Authority on with the letter of

the claims:

pages as originally filed/furnished

pages* as amended (together with any statement) under Article 19

pages* 9-12 received by this Authority on 27 January 2005 with the letter of 27 January 2005

pages* received by this Authority on with the letter of

the drawings:

pages 1/3-3/3 as originally filed/furnished

pages* received by this Authority on with the letter of

pages* received by this Authority on with the letter of

- a sequence listing and/or any related table(s) - see Supplemental Box Relating to Sequence Listing.

3. The amendments have resulted in the cancellation of:

- the description, pages
- the claims, Nos.
- the drawings, sheets/figs
- the sequence listing (*specify*):
- any table(s) related to the sequence listing (*specify*):

4. This report has been established as if (some of) the amendments annexed to this report and listed below had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).

- the description, pages
- the claims, Nos.
- the drawings, sheets/figs
- the sequence listing (*specify*):
- any table(s) related to the sequence listing (*specify*):

* If item 4 applies, some or all of those sheets may be marked "superseded."

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

International application No.

PCT/AU2004/000393

Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Claims 1-20	YES
	Claims	NO
Inventive step (IS)	Claims 1-20	YES
	Claims	NO
Industrial applicability (IA)	Claims 1-20	YES
	Claims	NO

2. Citations and explanations (Rule 70.7)

Claims 1-20 meet the criteria set forth in PCT Article 33 for novelty, inventive step and industrial applicability. The prior art published before the priority date does not disclose a piezoelectric dispensing device with a reservoir for containing such liquids as reagents, chemicals and oligonucleotides, with reservoir having an open top to allow the liquid to be poured in. There is also no disclosure of first filter means in the base of the reservoir as well as a second filter assembly which can be mounted to the reservoir. Furthermore, there is no disclosure of sealing the top of the reservoir with a plunger which seals the top and applies a pressure to the contents of the reservoir.

The prior art cited in the search report are all in the art of inkjet printers. There is no disclosure in these documents of the features and, given their very different nature, there is no motivation for the person skilled in the art to modify them to solve the problems identified in the specification.

these matters form part of the prior art base or were common general knowledge in the field relevant to the present invention as it existed before the priority date of each claim of this application.

- Throughout this specification the word "comprise", or variations such as
- 5 "comprises" or "comprising", will be understood to imply the inclusion of a stated element, integer or step, or group of elements, integers or steps, but not the exclusion of any other element, integer or step, or group of elements, integers or steps.

Summary of the Invention

- 10 In a first broad aspect, the present invention provides a piezoelectric dispensing apparatus for dispensing liquids including reagents, chemicals, oligonucleotides or the like, including:
- a removable reservoir for containing liquid for dispensing from the apparatus;
 - a piezoelectric dispensing tube defining a narrow bore in fluid communication
- 15 with the reservoir, the piezoelectric dispensing tube being separable from the reservoir; and
- means for applying a vacuum and/or pressure to the contents of the reservoir when the reservoir is located in the apparatus wherein the means for applying a variable vacuum and/or pressure to the contents of the reservoir when the reservoir is located in
- 20 the apparatus includes a plunger which is shaped and configured to abut with and seal with walls of the reservoir adjacent the top of the reservoir, thereby closing the top of the reservoir.

- One advantage of the present invention is that reagent can simply be loaded into the apparatus in the reservoir eliminating the existing and time consuming and
- 25 occasionally messy "dip and sip" technique.

- Typically the top of the reservoir will be open to allow liquids to be poured into the reservoir. Most preferably the top of the reservoir will be outwardly flared. The means for applying a vacuum and/or pressure to the contents of the reservoir when the reservoir is located in the apparatus will include a plunger which is shaped and
- 30 configured to abut with and seal the top of the reservoir. The plunger preferably defines a through bore to permit the application vacuum and or pressure to the reagent vessel through the bore.

In a second broad aspect, the present invention provides a reagent vessel for use with a piezoelectric device which provides filtering within the vessel.

- 35 In particular, there is provided a reservoir assembly for containing liquids including reagents, chemicals, oligonucleotides or the like, for dispensing from a

piezoelectric dispensing tube having a dispensing end and a non-dispersing end, the assembly including a reservoir defining an open top to allow liquids to be poured into the reservoir and an outlet at the base of the reservoir,

5 a first filter means located at the base of the outlet for filtering liquids passing through the outlet;

10 a secondary filter assembly which is separable from the reservoir, the secondary filter assembly defining a bore means in fluid communication with the reservoir and a second filter in said bore, the secondary filter assembly defining means for removably attaching the piezoelectric dispensing tube in fluid communication with the bore; further including

means for closing the outlet of the reservoir until the reservoir is attached to the removable secondary filter assembly.

15 The primary filter takes out most of the particles in solution. The secondary filter preferably has a pore size smaller than the primary filter and removes any particulate matter not removed by the primary filter and particulate material below the primary filter. Where the reservoir is removable from the vessel and also from the piezoelectric dispensing tube the secondary filter may be located between the reservoir and the non-dispersing end of the piezoelectric dispensing tube to prevent particulate matter collected on the underside of the reservoir from entering the tube.

20 In a further aspect of the present invention there is provided a piezoelectric dispensing device for dispensing liquids including reagents, chemicals, oligonucleotides or the like, the device, including:

25 a reservoir for containing liquid for dispensing from the apparatus, the reservoir defining an open top and an outlet at the base of the reservoir;

a filter means located at the base of the outlet for filtering liquids passing through the outlet;

a piezoelectric dispensing tube defining a bore;

means for removably attaching the piezoelectric dispensing tube in fluid communication with the reservoir; and

30 a closure means disposed at the base of the reservoir which closes the outlet of the reservoir until the reservoir is attached to a removable secondary filter attached to a piezoelectric dispensing tube.

35 The invention also provides a method of dispensing small quantities of liquids including reagents, chemicals, oligonucleotides or the like from a piezoelectric dispensing device, the device, including:

3a

a reservoir for containing the liquids, the reservoir defining an open top and an outlet at the base of the reservoir;

a filter means located at the base of the outlet for filtering liquids passing through the outlet;

5 a piezoelectric dispensing tube defining a bore;

means for removably attaching the piezoelectric dispensing tube in fluid communication with the reservoir; and

a closure means disposed at the base of the reservoir which closes the outlet of the reservoir until the reservoir is attached to a removable secondary filter attached to a

10 piezoelectric dispensing tube, comprising the steps of:

pouring a liquid into the reservoir via the open top;

applying a plunger or the like to the open top of the reservoir to seal the same and applying a vacuum or partial vacuum to the contents of the reservoir; and

dispensing one or more droplets of reagent from the piezoelectric tube.

15

Brief Description of the Drawings

A specific embodiment of the invention will now be described by way of example only, and with reference to the accompanying drawings in which:

Figure 1a is a schematic front view of a dispensing apparatus embodying the 20 present invention;

Figure 1b is a schematic side view of the dispensing apparatus of Figure 1;

Figure 2a is a schematic side view of a reagent vessel for use in the dispensing apparatus of Figure 1;

Figure 2b is a schematic front end view of a reagent vessel for use in the 25 dispensing apparatus of Figure 1;

Figure 2c illustrates a secondary filter assembly;

Figure 3 illustrates the reservoir of Figure 2a and secondary filter assembly of Figure 2c coupled to a piezoelectric dispensing device;

Figure 4 illustrates the mechanism controlling the plunger position; and

30 Figure 5 shows an alternative reagent vessel.

Detailed Description of a Preferred Embodiment

Referring to the drawings, Figure 1 shows a schematic diagram of a piezoelectric dispensing apparatus 10. The apparatus defines an array of four plungers

35 12 below which are aligned a series of four seats configured to receive and support reagent vessels 20 located below the plungers. The apparatus also includes associated

CLAIMS:

1. A piezoelectric dispensing apparatus for dispensing liquids including reagents, chemicals, oligonucleotides or the like, including:
 - a removable reservoir for containing liquid for dispensing from the apparatus;
 - 5 a piezoelectric dispensing tube defining a narrow bore in fluid communication with the reservoir, the piezoelectric dispensing tube being separable from the reservoir; and
 - means for applying a vacuum and/or pressure to the contents of the reservoir when the reservoir is located in the apparatus wherein the means for applying a variable
 - 10 vacuum and/or pressure to the contents of the reservoir when the reservoir is located in the apparatus includes a plunger which is shaped and configured to abut with and seal with walls of the reservoir adjacent the top of the reservoir, thereby closing the top of the reservoir.
2. A piezoelectric dispensing apparatus as claimed in claim 1 wherein the piezoelectric dispensing tube comprises a glass tube surrounded by a ceramic collar which expands and contracts when under the influence of a changing electric potential applied to the collar.
3. A piezoelectric dispensing apparatus as claimed in claim 2 wherein the top of the reservoir is flared outwardly and an O-ring extends around the plunger to provide a gas tight seal between the plunger and a top portion of the reservoir in contact with the plunger.
4. A piezoelectric dispensing apparatus as claimed in claim 3 wherein the plunger defines a through bore to permit the application of vacuum and or pressure to the reagent vessel through the bore.
- 25 5. A piezoelectric dispensing apparatus as claimed in any one of claims 3 to 4 including a seat for receiving the removable reservoir and means for moving the plunger up and down towards and away from the seat.
6. A reservoir assembly for containing liquids including reagents, chemicals, oligonucleotides or the like, for dispensing from a piezoelectric dispensing tube having a dispensing end and a non-dispensing end, the assembly including a reservoir defining an open top to allow liquids to be poured into the reservoir and an outlet at the base of the reservoir,
 - 30 a first filter means located at the base of the outlet for filtering liquids passing through the outlet;
 - 35 a secondary filter assembly which is separable form the reservoir, the secondary filter assembly defining a bore means in fluid communication with the

reservoir and a second filter in said bore, the secondary filter assembly defining means for removably attaching the piezoelectric dispensing tube in fluid communication with the bore; further including

means for closing the outlet of the reservoir until the reservoir is attached to the

5 removable secondary filter assembly.

7. A reservoir assembly as claimed in claim 6 wherein the second filter has a pore size smaller than the pore size of the first filter

8. A reservoir assembly as claimed in claim 6 or claim 7 wherein the second filter is located between the reservoir and the non-dispensing end of the piezoelectric
10 dispensing tube to prevent particulate matter collected on the underside of the reservoir from entering the tube.

9. A piezoelectric dispensing device for dispensing liquids including reagents, chemicals, oligonucleotides or the like, the device, including:

a reservoir for containing liquid for dispensing from the apparatus, the reservoir
15 defining an open top and an outlet at the base of the reservoir;

a filter means located at the base of the outlet for filtering liquids passing through the outlet;

a piezoelectric dispensing tube defining a bore;

means for removably attaching the piezoelectric dispensing tube in fluid
20 communication with the reservoir; and

a closure means disposed at the base of the reservoir which closes the outlet of the reservoir until the reservoir is attached to a removable secondary filter attached to a piezoelectric dispensing tube.

10. A piezoelectric dispensing device as claimed in claim 9 wherein the base of the
25 reservoir defines an annular foot portion on which the reservoir may be rested with the closure means spaced from the surface on which the foot rests.

11. A piezoelectric dispensing device as claimed in claim 10 wherein the reservoir defines a handle.

12. A piezoelectric dispensing device as claimed in any one of claims 9 to 11
30 wherein the closure means is a septum.

13. A piezoelectric dispensing device as claimed in any one of claims 9 to 11 wherein the closure means is a valve.

14. A piezoelectric dispensing device as claimed in any one of claims 9 to 14
35 wherein the means for removably attaching the piezoelectric dispensing tube in fluid communication with the reservoir

include a secondary filter assembly attachable to the base of the reservoir, the secondary filter assembly defining a bore which is in fluid communication with the reservoir when the secondary filter assembly is attached thereto.

15. A method of dispensing small quantities of liquids including reagents, 5 chemicals, oligonucleotides or the like from a piezoelectric dispensing device, the device, including:

a reservoir for containing the liquids, the reservoir defining an open top and an outlet at the base of the reservoir;

- 10 a filter means located at the base of the outlet for filtering liquids passing through the outlet;

a piezoelectric dispensing tube defining a bore;

means for removably attaching the piezoelectric dispensing tube in fluid communication with the reservoir; and

- 15 a closure means disposed at the base of the reservoir which closes the outlet of the reservoir until the reservoir is attached to a removable secondary filter attached to a piezoelectric dispensing tube, comprising the steps of:

pouring a liquid into the reservoir via the open top;

applying a plunger or the like to the open top of the reservoir to seal the same and applying a vacuum or partial vacuum to the contents of the reservoir; and

- 20 dispensing one or more droplets of reagent from the piezoelectric tube.

16. A method as claimed in claim 15 wherein the piezoelectric tube is placed in fluid communication with the reservoir after the liquid is poured into the open top of the reservoir.

17. A piezoelectric dispensing apparatus including a piezoelectric dispensing device 25 as claimed in any one of claims 10 to 19 further including a seat means for receiving the removable reservoir in the apparatus, means for applying a vacuum and/or pressure to the contents of the reservoir when the reservoir is located in the apparatus said means including a plunger which is shaped and configured to abut with and seal the top of the reservoir and which defines a through bore to permit the application of vacuum and or 30 pressure to the reagent vessel through the bore, and further including and means for moving the plunger up and down towards and away from the seat.

18. A piezoelectric dispensing apparatus as claimed in claim 17 wherein the reservoir is free from foam or other storage media.

19. A reservoir assembly as claimed in any one of claims 6 to 8 wherein the 35 reservoir is free from foam or other storage media.

20. A piezoelectric dispensing device as claimed in any one of claims 9 to 14 wherein the reservoir is free from foam or other storage media.